

Science

Grade-Level Expectations

Missouri Department of Elementary and Secondary Education
Draft - March 19, 2003

Standard 1: Properties and Principles of Matter and Energy

Draft 3/21/03

A. Properties and Structure of Matter												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grades 8, 9, 10	Grades 11-12
1. Objects and materials have properties that can be used to describe and classify them.	•Identify materials (cloth, paper, wood, metal, etc.) that make up an object •Describe physical properties (color, size, shape, mass, texture, etc.) of materials and objects by using the senses and/or simple tools (magnifier/centimeter ruler) •Sort objects based on observable properties (color, size, shape, mass, etc.)		•Use simple tools (magnifier, centimeter ruler, and balance,) to collect data describing the physical properties of materials and objects		4. Matter is made of particles too small to be seen.		•Explain using words or drawings how heating and cooling affect the arrangement and motion of particles •Illustrate how matter is made of particles too small to be seen (See SC 5)			7. The periodic table organizes the elements according to their physical properties and chemical reactivity.	•Create and explain the structure of the periodic table in terms of the elements with common properties (groups/families) and repeating properties (periods) •Contrast the common properties of metal and nonmetals and their location in the periodic table •Explore the relationship of chemical reactivity and position on the periodic table through various laboratory experiments	
ST	SC 1 1.2, 1.6		SC 1 1.2, 1.4		ST		SC 1 1.6, 1.8			ST	SC 1 1.6, 3.5	
FR	III A1 (K-4); III A6 (K-4)		III A1 (K-4); III A6 (K-4)		FR		III C2 (K-4); III A4 (5-8)			FR	III A1 (9-12)	
2. Matter is anything that takes up space, has mass, and exists as solids, liquids, or gases that can be combined to form mixtures.		•Measure the mass of objects using a balance •Compare the mass of objects •Order objects according to mass	•Compare properties of water as a solid, liquid and gas •Classify everyday objects/substances as solid, liquid or gas •Record how various solids behave when mixed with water •Investigate ways to separate mixtures		5. Substances can be described by their properties.			•Describe a substance according to its properties (magnetic, conductivity, melting point, boiling point, and solubility) •Identify and measure particular properties using the appropriate tool(s) (graduated cylinder, balance, thermometer, voltmeter, etc.)		8. Properties of mixtures depend upon the concentrations, properties, and interactions of particles.	•Examine through experimentation the properties of mixtures •Qualitatively distinguish between the types of solutions (dilute, concentrated, saturated, supersaturated) •Organize examples of mixtures into heterogeneous and homogeneous (solutions) categories •Distinguish and compare the properties of acid and basic and neutral solutions (taste, feel, pH)	
ST			SC 1 1.2, 1.8	SC 1 1.3	ST			SC 1 1.2,1.4		ST	SC 1 1.2, 1.6	
FR			III A2 (K-4); III A3 (K-4)	III A4 (K-4)	FR			III A2 (5-8); I A2 (5-8)		FR	III A7 (3-8) III A3 (9-12)	

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	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grades 8, 9, 10	Grades 11-12
3. Properties and states of matter can change.			•Predict the changes in properties and states of matter when heated or cooled (melting, freezing, evaporation, condensation) •Measure and compare the difference in temperature as water changes from a solid to a liquid or a liquid to a solid		6. Matter exists as pure substances and mixtures.			•Compare the properties of a pure substance to a mixture •Using appropriate tools, separate a mixture using different methods (filtration, evaporation, chromatography, magnets) and compare the results •Compare the changes that occur when different substances are mixed with water •Identify the components of a solution		9. The atomic model describes the electrically neutral atom.	•Classify the three main subatomic particles according to location, charge, and mass •Calculate the numbers of protons, neutrons, and electrons of an element (or isotopes) given its atomic mass (or mass number) •Describe the information provided by the atomic number and the mass number	
ST			SC 1 1.2, 3.5		ST			SC 1 1.2, 1.4		ST	SC 1 1.6, 3.5	
FR			III A6 (K-4)		FR			III A3 (5-8); III A5 (K-4)		FR	III A4 (9-12)	
										bonding is the combining of elements to form new substances with definite properties.	•Distinguish the types of chemical bonding and their relationship to valence electrons •Predict which elements form chemical bonds and which type of bond is formed, if any •Explain why atoms form chemical bonds	
ST											SC 1 1.6, 2.4	
FR											III A3 & A7 (5-8); III A2 & A3 (9-12)	

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B. Forms and Sources of Energy												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grades 8, 9, 10	Grades 11-12
1. Forms of energy (sound and heat) have a source, a means of transfer, and a receiver.	•Compare the different ways objects such as bells, whistles, and glasses containing water can produce different sounds •Create a list of sounds in our everyday life	•Describe the effect of the Sun's heat on various objects •Using a thermometer, measure the differences in temperature over time on different colored objects placed under a heat source •Compare the effect of color on the amount of heat absorbed by an object		•Produce and compare sounds by blowing, plucking, and tapping •Compare the different ways to change pitch within each of the above sources of sound •Sort all objects showing evidence that sound travels as vibrations and those that do not •Compare how sound traveling through different materials (air in baggie, water, solids) and order best to least •Identify the ear as the receiver of sound vibrations	2. Forms of energy (electricity and light) have a source, a means of transfer and a receiver.	•Construct and diagram a complete electric circuit by using a source (battery) a means of transfer (wires) and a receiver (resistance bulbs, diodes, motors, fans) • Observe and describe the effects of transferring energy from the source to the resistor (heat, light, sound and motion) •Describe the advantages and disadvantages of series and parallel circuits •Classify different materials as conductors or insulators			•Identify producers of light •Use appropriate tools (pinhole viewer, ray box, and laser pointer) to show that light travels in a straight line •Compare the reflection of light from various surfaces (mirrors) •Conduct an investigation and compare the refraction of light passing through different materials (prisms, water, lenses, etc.) •Using a prism, illustrate and explain that white light is a mixture of many different colors of light that are visible to the human eye	4. Energy is the measure of actual or potential change in matter and can be classified in various ways.	•Examine various forms of energy and their properties •Explore various changes in matter including chemical, nuclear, thermal, mechanical, electrical, or a phase change •Construct a phase change diagram or concept map, showing the relationship between temperature and various energy changes •Design a device that performs a task by changing forms of energy several times •Compare and contrast heating/cooling curves of water vs. other substances	
ST	SC 1 1.2, 2.1	SC 1 1.2, 4.1		SC 1 1.2, 3.5	ST	SC 1			SC 1 1.2, 1.4, 1.6	ST	SC 1 1.2, 1.8, 3.5	
FR	III B3 (K-4)	III B3 (K-4)	III B3, B7, B8	V B2 (K-4)	FR	III B3 (5-8)			III B1 & B8 (K-4)	FR	III B1 , C1, C2, C3 (9-12)	
					change in temperature in many processes that indicates a change in heat energy.		•Compare the amount of heat energy to the movement of molecules •Distinguish among convection, conduction, and radiation			5. Compare and identify the various ways the total energy of the universe (that is constant) can be transferred.	•Using the law of conservation of energy, explain how energy can be transferred or transformed but not lost	
ST							SC 1 1.2, 1.4			ST	SC 1 1.3, 1.8	
FR							III C2 (5-8)			FR	III B1 (5-8)	

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B. Forms and Sources of Energy												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grades 8, 9, 10	Grades 11-12
										and certain physical properties of substances (melting point, boiling point, specific heat) are explained by the kinetic theory of matter.	•Compare heat (thermal energy) to moving particles (molecules or atoms) •Differentiate between heat (thermal energy) and temperature •Interpret examples of energy transfer as convection, conduction or radiation. Apply these concepts to new situations	
ST					ST					ST	SC 1 1.3, 1.4, 2.4	
FR					FR					FR	III C3 (5-8); IV C1 (5-8); III C2 (9-12)	
										are changes in the nucleus of the atom.	•Identify the source of radioactivity (stability of the nucleus) •Compare and contrast the three different types of radioactive decay •Conduct experiments to demonstrate the concept of radioactive decay •Compare and contrast a nuclear chain reaction (fission) and the process of fusion •Interpret data from the decay of a radioactive sample over time (table or graph)	
ST											SC 1 1.2, 1.5, 1.6, 1.8, 3.5	
FR											III C5 (9-12)	

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B. Forms and Sources of Energy												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grades 8, 9, 10	Grades 11-12
										8. Chemical reactions involve changes in the bonding of atoms.	<ul style="list-style-type: none">•Describe the relationship between chemical bonds and chemical changes•Identify sources of chemical energy (i.e. food and fuel)•Identify real world reactions where energy is taken in (endothermic) or given off (exothermic)•Conduct an experiment to compare the mass of the reactants and the mass of the products in a chemical reaction•Utilize the Law of Conservation of Mass to balance chemical equations	
ST					ST					ST	SC 1 1.2, 1.3, 3.5	
FR					FR					FR	III B5 (5-8)	

Standard 2: Properties and Principles of Force and Motion

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A. Motion												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
1. The position and motion of an object can be described by locating it relative to another object or the background.	• Describe an object's position relative to another object by using the words: above, below, in front of, behind	•Compare the speed by which two objects are moving •Compare the position of a moving object relative to another moving object (faster or slower, left or right) •Describe an object's motion as straight, circular, or zigzag			3. The motion of an object can be described as a change in position, direction, and speed.	•Graphically represent and explain an object's motion in terms of distance over time (speed)				6. Motion involves a change in position during a certain period of time.	•Compare the speed of two objects in terms of distance and time •Interpret the motion of an object from a distance vs. time graph •Distinguish between speed and velocity	•Using concepts including distance, displacement, speed, velocity and acceleration
ST	SC 2 1.6		SC 2 1.6		ST	SC 2 1.8				ST	SC 2 3.1	SC 2 2.2
FR	IV A1 (K-4)		IV B1 (K-4)		FR	IV A2 (5-8)				FR	IV A1 (9-12)	IV A2 (9-12)
2. The way to change the position or motion of an object is to give it a push or pull (force).			•Demonstrate how applying a force can speed up, slow down, or stop the motion of an object •Measure in centimeters the distance an object moves when pushed or pulled •Match everyday objects with the force (push or pull) required to do the job		4. An unbalanced force acting on an object changes its speed, direction of motion, or both.	•Compare the effects of balanced and unbalanced forces on an object's motion •Compare how the magnitude of the change of speed or direction is affected by the amount of force and the mass of the object				7. An object that is accelerating is speeding up, slowing down, or changing direction.	•Describe the acceleration of an object in terms of its velocity over a period of time •Measure and analyze an object's motion in terms of speed, velocity, and acceleration	
ST			SC 2 3.6		ST	SC 2 1.6				ST	SC 2 2.2	
FR			IV B2 (K-4)		FR	IV C3 (K-4)				FR	IV A3 (5-8)	

A. Motion												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
					5. Mechanical energy is the energy of movement or position of an object.	<ul style="list-style-type: none">•Describe kinetic energy as the energy of motion and give examples•Describe potential energy as the energy of position or condition and give examples				8. Momentum depends on the mass of the object and the velocity with which it is traveling.	<ul style="list-style-type: none">•Compare the momentum of two objects in terms of mass and velocity•Describe how the total momentum remains constant in a system•Relate momentum to motion•Experimentally demonstrate conservation of momentum•Predict how conservation of momentum will affect the behavior of a system (flywheel, gyroscope, etc.)•Explain the connection between momentum principles and Newton's Laws	
ST					ST	SC 2 1.6				ST	SC 2 1.6	
FR					FR	IV C1 (5-8)				FR	IV B1 (9-12)	

Standard 2: Properties and Principles of Force and Motion

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B. Forces												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
1. A relationship exists between the strength of a force and its effect on the motion of an object.			•Measure and compare the force required to move an object when the mass is increased or decreased •Measure and compare the distance an object travels when the force applied is increased or decreased		4. A relationship exists between the strength of a force and its effect on the motion of an object.	•Explain how increasing or decreasing the force affects the motion of an object •Explain how the mass of an object affects the force required to move it			•Describe and represent an object's motion graphically in terms of distance over time (speed)	8. Circular motion requires a force directed towards the center of a circle and projectile motion requires a force acting down.	•Describe the force that keeps an object traveling in a circular path	
ST			SC 2 1.4		ST	SC 2 1.2			SC 2 3.1	ST	SC 2 1.6	
FR			IV B3 (K-4)		FR	IV B3 (5-8)			IV A2 (5-8)	FR	IV A1 (9-12)	
					5. When forces are balanced, objects are at rest or stay constant.		•Predict whether various objects will float or sink •Use a spring scale to weigh objects •Measure mass using non-standard units •Design an experiment to find out what factors (material, size, shape, salt water, and fresh water) affect buoyancy •Construct a vessel that will support the most cargo					
					ST		SC 2 1.2					
					FR		No FR					

Standard 2: Properties and Principles of Force and Motion

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B. Forces												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
2. There are different kinds of forces that can be applied to objects including gravity, magnetism, and friction.	•Demonstrate that magnets can be used to make some things move without being touched		•Demonstrate that magnets attract and repel each other and attract certain kinds of other materials (iron, steel, etc.) •Describe magnetism as a force that can push or pull •Describe gravity as a force that pulls •Measure and compare the force required to move an object over different surfaces		6. There are different kinds of forces (magnetic, gravitational, and frictional).	•Describe gravity as a force that pulls •Describe ways machines or tools exert a force •Identify friction as a force acting on moving objects •Demonstrate how to increase or decrease friction			•Describe the effects of balanced and unbalanced forces on an object's motion •Explain how the magnitude of the change of speed or direction is affected by the amount of force and the mass of the object	9. The overall effect of many forces acting on an object at the same time is called a net force. The size and direction of this net force determines the change in motion of an object (Newton's Laws of Motion).	•Describe inertia (a property of matter in which an object at rest tends to remain at rest or an object in motion tends to remain in motion unless acted upon by an unbalanced force) in terms of mass and explain how it affects motion •Using information about the mass and acceleration of two objects, compare the force required to move them (force = mass x acceleration) •Predict the action/reaction forces acting between two objects in an everyday example (i.e. handball hits concrete wall)	
ST	SC 2 1.6		SC 2 3.1		ST	SC 2 1.1			SC 2 1.2	ST	SC 2 1.6	
FR	IV C1 (K-4)		IV C1 (K-4)		FR	IV B4 (K-4)			IV C1 (5-8)	FR	IV C1 (9-12)	
3. Ramps affect the force required to move an object.			•Measure the amount of force it takes to pull an object up a ramp •Measure, record, and graph the distance an object travels down ramps of different heights •Apply the use of a ramp to different real-life situations		7. Simple machines (levers, ramps, and gears) can be used to affect the force applied to an object and/or direction of movement.				•Explain how simple machines change the amount or direction of force required •Determine the amount of work done when an object is moved	10. In most situations, frictional forces complicate the description of motion although the basic principles still apply.	•Collect information from experiments to describe how frictional forces cause objects to slow down and/or eventually stop •Gather data to describe how frictional forces cause objects to fall at different rates	
ST			SC 2 3.1		ST				SC 2 1.6	ST	SC 2 3.6	
FR			IV C4 (K-4)		FR				IV C3 (5-8)	FR	IV B2 (9-1)	

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B. Forces												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
										11. Every object exerts a force on every other object. Its magnitude depends on the masses of the objects and the distance between them.	•Compare and describe the gravitational force between two objects •Calculate weight in terms of the mass of an object and the acceleration of gravity	
ST					ST					ST	SC 2 1.6	
FR					FR					FR	IV B3 (5-8)	
										12. Mechanical energy comes from the motion (kinetic energy) and/or position (potential energy) of an object.	•Using knowledge gathered through experiments, identify the relationship among the kinetic energy of an object with its mass and its velocity •Identify the conversion between potential energy and kinetic energy of a given moving object (i.e. tennis ball dropping, pendulum swinging); predict where kinetic and potential energies are the greatest and least in the motion	
ST					ST					ST	SC 2 1.6	
FR					FR					FR	IV C1 (9-12)	
										13. The work done on an object depends on both the applied force and the distance the object moves.	•Compare the relationship between work, force applied to an object, and the distance the object moves •Describe how work can change an object's kinetic energy, potential energy, or both •Describe power in terms of work and time •Describe the factors that affect the efficiency of machines	
ST					ST					ST	SC 2 1.1, 1.6	
FR					FR					FR	IV C2 (9-12)	

B. Forces												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
										14. Moving electric charges produce magnetic fields that exert a magnetic force on other objects.	<ul style="list-style-type: none">•Use knowledge gathered through investigations to describe how magnetism is used to produce electricity•Explain that moving electric charges produce a magnetic field•Construct a time line through research to identify discoveries in the late 1800's and early 1900's and their relationship to electricity and magnetism•Compare and contrast the energy conversions in a generator with those of an electric motor	
ST					ST					ST	SC 2 3.1	
FR					FR					FR	IV B3 (9-12)	

A. Characteristics of Organisms (Plants & Animals)												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
1. Plants and animals are alive and have characteristics and basic needs that make them different from non-living matter.		<ul style="list-style-type: none">•Summarize data collected from a fair test to determine the needs of a plant (air, light, water, nutrients)•Sort living and non-living things in to groups•Identify characteristics of living and non-living things•Describe the basic needs of most animals (air, water, shelter)•Compare and contrast ways that plants and animals have their needs met by different environments			4. Organisms can be classified into groups based on characteristics.		<ul style="list-style-type: none">•Classify animals as vertebrates and invertebrates•Classify animals into classes (amphibians, fish, birds, mammal, and reptiles)•Explain how characteristics of each class are the basis for organization•Classify plants as monocot or dicot•Use a simple dichotomous key to identify a plant or animal•Design an experiment to test variables that affect the growth/ health and reproduction capabilities of plants			7. The sequence of DNA determines hereditary characteristics.	<ul style="list-style-type: none">•Illustrate the structure of DNA, including the correct pairing of nitrogen bases	
ST		SC 3 1.6, 2.3			ST		SC 3 1.6			ST	SC 3	
FR		VII A3 (K-4); VII B2 (K-4)			FR		VII A1 (5-8)			FR	VII A3 (9-12)	
2. Observable characteristics of living organisms can be used to sort and group them.		<ul style="list-style-type: none">•Observe and compare plants based on physical characteristics (stems, leaves, flowers, etc.)•Observe and compare animals based on their physical characteristics (i.e. appendages, skin covering, eyes, beaks, etc.)			5. Organisms may have beneficial and detrimental impact on other organisms.				<ul style="list-style-type: none">•Discuss and differentiate between bacteria, viruses, fungi, and parasites•Explain the beneficial and detrimental impact that organisms (viruses, bacteria, fungi, and parasites) may have on humans (i.e. cause of diseases, production of vaccines, source of antibiotics, immune responses, food production)	8. Coding errors in DNA synthesis (mutation) can occur randomly during replication and can also be caused by heat, radiation, and certain chemicals.	<ul style="list-style-type: none">•Explain how an error in the DNA code can be transferred during replication	
ST		SC 3 1.6			ST				SC 3 3.1, 1.6	ST	SC 3	
FR		VII A1 (K-4)			FR				VII A3 (5-8)	FR	VII D3 (9-12)	

A. Characteristics of Organisms (Plants & Animals)												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
3. Some plants and animals have developed specialized structures that provide them with information about their environment and help them survive.	•Observe the behaviors of plants and animals •Use the five senses of a human to gather information and observations; explain the function of each	•Observe and describe the senses and other specialized structures (roots, cactus needles, thorns etc.) that allow plants to survive in their environment •Observe and describe the senses and other specialized structures (i.e. antennae, camel's hump, whiskers, appendages, etc.) that allow animals to survive in their environment			6. Some diseases are the result of the breakdown within one or more body systems or at the cellular level.				•Explain the cause and effect of diseases on the human body (AIDS, cancer, MS, diabetes, and hypertension)			
ST	SC 3 3.1	SC 3 3.1			ST				SC 3 3.1	ST		
FR	VII A2 (K-4)	VII A2 (K-4); VII E1 (K-4)			FR				NO FR	FR		

B. Structure and Function of Living Systems												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
1. Organisms (plants and animals) go through life cycles.			•Record observations of the life cycle of an organism •Sequence the stages in the life cycle of a particular organism (butterfly, frog, bean plant, etc.)		2. All living things are made of at least one cell.			•Communicate detailed observations of different types of cells through writing, drawing, and discussion •Using magnifiers, including hand lenses and microscopes, to observe living and non-living specimens •Distinguish how different cells (plants vs. animals) and organelles (nucleus, cell membrane, cell wall, chloroplasts, vacuoles, cytoplasm) are specialized to perform various tasks •Illustrate how and explain why cells need to grow and divide		6. Plants and many microorganisms use solar energy to carry out the process of photosynthesis, which provides a connection between the Sun and living organisms.	•Explain the energy transfer processes that occur during photosynthesis by using the terms chlorophyll, ATP, and NADPH	
ST			SC 3 1.6		ST			SC 3 2.1, 1.4, 1.6		ST	SC 3	
FR			VII B1 (K-4)		FR			VII A2 (5-8); VII B1 (5-8)		FR	VII A1 (9-12)	
					3. Multi-cellular organisms are interacting systems of cells, tissues, organs, and organ networks that carry out life processes.			•Identify and give examples of each level of organization		7. Photosynthesis and cellular respiration are complimentary processes.	•Compare and contrast photosynthesis and cellular respiration •Compare and contrast the purpose, structure, and role of mitochondria and chloroplasts	
ST					ST			SC 3 3.1		ST	SC 3	
FR					FR			VII B3 (5-8)		FR	VII A2 (9-12); VII B2 (9-12)	

Standard 3: Characteristics and Interactions of Living Organisms

Draft 3/21/03

B. Structure and Function of Living Systems												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
					4. Humans have interacting systems for digestion, respiration, reproduction, circulation, excretion, movement, control and coordination, and for protection from diseases.				•Illustrate and explain the path nutrients take as they are processed by the digestive system, pass into the blood stream, and are transported into the cell •Illustrate and describe the path oxygen takes as it enters the body, passes into the blood stream, and is transported into the cell •Illustrate and describe the path an impulse may take due to a stimulus and the appropriate response that may result •Explain how genetic information passes from parents to offspring	8. Cells carry out chemical transformations that allow conversion of energy from one form to another, the breakdown of molecules into smaller units, and the building of larger molecules from smaller ones.	•Compare and contrast anabolic and catabolic processes	
ST					ST				SC 3 3.1	ST	SC 3	
FR					FR				VII B3 (5-8)	FR	VII B1 (9-12)	
					5. Cellular activities and responses can maintain stability internally while external conditions are changing.				•Given a scenario, predict the response the human body may take to maintain internal balance during an environmental change	9. The genetic information stored in DNA dictates protein synthesis.	•Explain how the DNA code determines the sequence of amino acids in a protein	
ST					ST				SC 3 3.5	ST	SC 3	
FR					FR				VII C2 (5-8)	FR	VII A3 (9-12)	
										10. Most cell functions involve chemical reactions that are controlled by enzymes.	•Explain how enzymes speed up chemical reactions •Interpret a data table showing the effects of an enzyme on a chemical reaction	
ST					ST					ST	SC 3	
FR					FR					FR	VII B1 (9-12)	
										11. Homeostasis is maintained in organisms as a result of special functions performed at the cellular level using transport systems (diffusion, osmosis, active transport, phagocytosis, and pinocytosis)	•Explain how concentration gradients affect the transport of molecules	
ST					ST					ST	SC	
FR					FR					FR	VII A2 (9-12)	

C. Reproduction and Heredity												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
					1. Reproduction is essential to the continuation of every species.			•Explain the importance of reproduction •Differentiate between sexual and asexual reproduction •Compare and contrast the advantages and disadvantages of sexual and asexual reproduction		3. The pattern of inheritance for many traits can be predicted by using the principles of Mendelian genetics.	• Using a monohybrid cross predict the probability of the occurrence of specific traits in an offspring	
ST					ST			SC 3 1.1, 3.5		ST		
FR					FR			VII D1 (5-8)		FR	VII D2 (9-12)	
					2. Many plants and animals reproduce sexually.			•Explain how sexual reproduction perpetuates plant and animal life •Identify organisms that reproduce sexually with sperm and egg		4. Chromosomes are components of cells that occur in pairs and carry hereditary information from one cell to its daughter cell and from a parent to its offspring.	• Explain how sexual reproduction perpetuates plant and animal life • Explain how DNA of parent cells replicates to form identical chromosomes in cells (asexual reproduction of unicellular organisms and mitosis in multi-cellular organisms) • Identify organisms that reproduce sexually with sperm and egg • Compare mitosis and meiosis and explain the advantages and disadvantages of each	
ST					ST			SC 3 3.1		ST	SC 3 3.1	
FR					FR			VII D3 (5-8)		FR	VII D4 (9-12); VII D5 (9-12)	

D. Change Over Time												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8 ,9, 10	Grade 11-12
										1. Similarities in DNA and protein structure can be used to classify and determine degrees of similarities among organisms.	•Based on a data table, identify the organisms that a scientist might conclude are related; be able to justify your reasoning	
ST					ST					ST	SC 3 1.8	
FR					FR					FR	VII C1 (9-12)	
										2. Natural selection favors the organism whose behavior is flexible enough to deal with changing environments and whose traits allow reproductive success and survival.	•Given two scenarios, select and justify the scenario that best represents the concept of natural selection	
ST					ST					ST	SC 3 1.6	
FR					FR					FR	VII C2 (9-12)	
										3. The process of natural selection provides some advantage of survival to individuals within a species due to mutation and recombination of certain heritable variations.	•Identify various factors that could enhance the chances for survival of an organism due to natural selection	
ST					ST					ST	SC 3 3.1	
FR					FR					FR	VII E2 (9-12)	

Standard 4: Changes in Ecosystems and Interactions of Organisms With Their Environments

Draft 3/21/03

A. Populations and Ecosystems												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
1. All living organisms interact with each other and their environment in order to live and grow.				<ul style="list-style-type: none">List the ways a specific organism may interact with other organisms or with the environment in order to live and growMatch and explain specific examples of producer/consumer and predator/prey relationshipsSequence the flow of energy through a food chainPredict the possible effects of removing an organism from a food chain	3. All populations living together and the physical factors with which they interact compose an ecosystem.	<ul style="list-style-type: none">Categorize populations of organisms as producers, consumers, and decomposers by the role they serve in the ecosystem		<ul style="list-style-type: none">Identify the biotic and abiotic factors that would affect the population number of particular organisms that an ecosystem could supportPredict how abiotic and biotic factors determine the populations within an ecosystem		7. Matter is recycled in an ecosystem.	<ul style="list-style-type: none">Trace nitrogen, carbon, calcium, or phosphorus through an ecosystemExplain the importance of cycles within an ecosystem	
ST				SC 4 1.6, 3.1	ST	SC 4 1.6		SC 4 3.1		ST	SC 4 1.1, 1.6	
FR				VIII A2 (K-4)	FR	VIII A4 (5-8)		VIII A3 (5-8)		FR	VIII A2 (5-8)	
2. Organisms exhibit behaviors that allow them to deal with changes in their environment (hibernation and migration).				<ul style="list-style-type: none">Research changes in animal behaviors and reactions to seasonal changesCollect and record data describing effects of an environmental change on a specific organism	4. As energy flows through the ecosystem, all organisms must capture the portion of energy available to them and transform it to a usable form.	<ul style="list-style-type: none">Explain how plants produce their own foodDifferentiate between the three types of consumers (herbivore, carnivore, and omnivore)		<ul style="list-style-type: none">Diagram and describe the flow of energy in an energy pyramidAll organisms, including humans, are part of and depend on one global food web that begins with organisms at the bottom of the energy pyramid		8. Energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores, to carnivores and decomposers.	<ul style="list-style-type: none">Show the flow of energy within a food web and calculate the available energy of each trophic level	
ST				SC 4 1.2	ST	SC 4 4.1		SC 4 2.1, 1.1		ST	SC 4 1.8	
FR				VIII A4 (K-4)	FR	VIII A1 (5-8)		VIII A4 (5-8)		FR	VIII A1 (5-8)	
					5. Matter is recycled in an ecosystem.			<ul style="list-style-type: none">Identify and label the steps of the water, nitrogen, and carbon cycles		9. Organisms both cooperate and compete in ecosystems and therefore may generate stable ecosystems for years.	<ul style="list-style-type: none">Identify the relationships of mutualism, commensalism, parasitism, and predator/prey that are present in a given scenarioExplain how cooperative and competitive relationships help maintain balance within an ecosystem	
ST					ST			SC 4 1.1		ST	SC 4 3.5	
FR					FR			VIII A2 (5-8)		FR	VIII A1 (9-12)	

Standard 4: Changes in Ecosystems and Interactions of Organisms With Their Environments

Draft 3/21/03

A. Populations and Ecosystems												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
					6. All organisms, including humans and their activities, cause changes in their environments that can be either beneficial or harmful to the organisms in the ecosystem.	•Observe and describe beneficial and harmful activities that affect an ecosystem •Identify examples in Missouri where human activity has had a beneficial or harmful effect on organisms				10. Living organisms have the capacity to produce populations of infinite size but environments and resources are finite.	• Identify and explain the factors that may affect the carrying capacity of an organism within an ecosystem	
ST					ST	SC 4 3.6				ST	SC 4 3.1	
FR					FR	VIII B2 (5-8)				FR	VIII B1 (9-12)	
										11. Human decisions concerning the use of resources alter the stability and biodiversity of ecosystems (i.e. destruction caused by direct harvesting, pollution, atmospheric changes, etc.).	•Given a situation, devise a multi-step plan to regain the stability and/or biodiversity of the ecosystem	
ST					ST					ST	SC 4 3.8	
FR					FR					FR	VIII B2 (9-12)	
										12. No two species occupy the same niche in an ecosystem so that different species can coexist and help maintain the stability of that system.	•Give examples of competitors in a given ecosystem and describe behaviors and circumstances that would allow them to co-exist	
ST					ST					ST	SC 4 4.1	
FR					FR					FR	VIII A2 (9-12)	
										13. Biological, chemical, and physical processes interconnect ecosystems so that changes in one ecosystem may have local or global consequences.	•Predict how changes in one ecosystem may affect another ecosystem	
ST					ST					ST	SC 4 1.2	
FR					FR					FR	VIII B1 (9-12)	

B. Diversity and Adaptation												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
										1. The variety of organisms in an ecosystem changes when environmental conditions change. This can be beneficial or harmful to organisms.	•Research and record examples that illustrate organized changes due to environmental conditions	
ST					ST					ST	SC 4 3.6	
FR					FR					FR	VIII B1 (9-12)	
										2. Extinction of a species occurs when the environment changes and the species is unable to adapt.	•Research possible causes of extinction and support the theory with documentation of known facts	
ST					ST					ST	SC 4 4.1	
FR					FR					FR	VIII B2 (9-12)	

A. Solid Earth												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
1. Soils are a mixture of many materials with different-sized particles and a variety of properties.			•Identify, compare, and record the physical properties of soils (odor, appearance, grain size, texture, and absorption of water)		4. The Earth’s crust is composed of soils, rocks, and minerals.		•Use senses to identify rocks and minerals			12. Methods exist that are used to estimate geologic time.	•Observe and compare rock sequences then use fossils to correlate sequences at various locations •Use the known decay rates of radioactive isotopes present in rock to measure the time since the rock was formed	
ST			SC 5 1.6		ST		SC 5 1.2			ST	SC 5 1.3	
FR			VI A3 (K-4); VI A7 (K-4)		FR		VI A3 (5-8)			FR	VI B3 (5-8)	
2. Dead plants become part of the soil. Composting is an effective way to recycle old plants and other organic material.			•Set up, observe, and compare a compost bag with worms, soil, and plant remains to a compost bag with only soil and plant remains		5. Each mineral is composed of only one substance and that substance is the same in all samples of the mineral.		•Identify minerals using color, texture, smell, luster, hardness, shape, and reaction to magnets					
ST			SC 5 1.2		ST		SC 5 3.1			ST		
FR			VI A8 (K-4)		FR		VI A3 (5-8); VI A4 (5-8)			FR		
3. The history of the Earth can be traced through the fossil record.			•Compare/contrast the characteristics of different fossils •Construct model dinosaur skeletons or make imitation fossils		6. Rocks are composed of different combinations of minerals.		•Record observations of different types of rocks •Use observations to classify rocks					
ST			SC 5 2.1		ST		SC 5 1.4			ST		
FR			VI A5 (K-4)		FR		VI A3 (5-8); VI A4 (5-8)			FR		
					7. There is a rock cycle.		•Create a diagram showing the three ways rocks are formed		•Observe, identify, and classify rocks by their chemical and physical properties and the processes that formed them			
ST					ST		SC 5 2.1			ST		
FR					FR		VI A5 (5-8)		VI A3 (5-8)	FR		

Standard 5: Process and Interactions of the Earth’s Systems

Draft 3/21/03

A. Solid Earth												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
					8. The solid Earth consists of specific zones that each have unique distinguishable characteristics.				•Illustrate, label, and describe Earth’s layers: crust, mantle, inner core, and outer core •Construct a model that identifies the major plates that make up the Earth’s crust •Record data that shows crustal plates moving at rates of centimeters per year and account for the Theory of Plate Tectonics •Research and present evidence on the theory that a single supercontinent once existed •Create a project that demonstrates how crustal plates collide, separate, and slide past one another			
ST					ST				SC 5 3.6	ST		
FR					FR				VI B3 (5-8)	FR		
					9. The Earth’s crust is constantly changing due to the process of weathering and human interactions with the Earth.	•Assemble a model that investigates the variables (amount of water, time, slope) that influences erosion and deposition of Earth’s materials •Discuss and show ways humans can affect erosion and deposition through the clearing of land, planting vegetation, and building dams						
ST					ST	SC 5 3.1				ST		
FR					FR	VI B3 (5-8)				FR		
					10. The Theory of Plate Tectonics accounts for the movement of crustal plates. Convection currents in the mantle propel Earth’s crustal plates.				• Construct a map illustrating the three main belts of intense earthquake and volcanic activity and relate belts to the movement of crustal plates			
ST					ST				SC 5 3.5	ST		
FR					FR				VI B3 (5-8)	FR		

A. Solid Earth												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
					11. There are processes that change the surface of the Earth.				<ul style="list-style-type: none"> •Gather evidence and record the abrupt changes in the Earth's surface after earthquakes and volcanic eruptions • Create models to demonstrate the gradual changes in the Earth's surface caused by uplifting and wearing down of mountains •Gather evidence that waves, wind, water, and ice shape and reshape the Earth's surface by eroding rock and soil 			
ST					ST				SC 5 1.2	ST		
FR					FR				VI B3 (5-8)	FR		

Standard 5: Process and Interactions of the Earth’s Systems

Draft 3/21/03

B. Atmosphere, Weather and Climate												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
1. The composition and structure of the Earth's atmosphere contains many elements.		•Observe, measure and record weather using thermometers, rain gauges, and weather vanes •Observe and record cloud cover, precipitation, wind, and temperature			2. Weather is cloud cover, precipitation, wind speed and direction, temperature and pressure in the atmosphere which is in a constant state of change.		•Collect and analyze weather data using satellites, Doppler radar, barometers, thermometers, and anemometers •Use the data to make weather forecasts			4. The composition of the atmosphere affects weather changes.	•Construct a scale diagram of the structure of the Earth's atmosphere •Compare and contrast the composition and structure of the Earth's atmosphere •Identify different types of air masses, fronts, and storms and predict changes that occur over time	
ST		SC 5 1.8			ST		SC 5 1.4			ST	SC 5 1.1	
FR		VI A4 (K-4)			FR		VI A2 (5-8)			FR	VI A2 (9-12)	
					3. Natural catastrophic events are powerful and often dramatic forces that can affect our planet and living thing that inhabit it.				• Sequence and explain how tornadoes, hurricanes, and storms form •Describe the impact of tornadoes, hurricanes, and storms on Earth	5. There are many factors that impact the Earth's climate.	•Investigate how changes in the atmosphere and ocean temperatures cause changes in the climate •Explain how meteor impacts and volcanic eruptions affect the climate	
ST					ST				SC 5 3.1	ST	SC 5 3.1	
FR					FR				NO FR	FR	VI B3 (9-12)	
										6. The Sun is the principle energy source for phenomena on the Earth's surface.	•Demonstrate, using a globe and a light source, the uneven heating of the Earth's surface •Create a model and explain how winds, ocean currents, and the water cycle are all driven by the Sun's energy	
ST					ST					ST	SC 5 2.6	
FR					FR					FR	VI B3 (9-12)	
										7. Winds and ocean currents are produced on the Earth's surface.	•Explain how the Earth's rotation affects wind patterns (Coriolis effect) •Diagram the uneven heating and rotation of the Earth, which causes air masses to form and move in predictable patterns (Global Winds)	
ST					ST					ST	SC 5 3.5	
FR					FR					FR	VI B2 (9-12)	
										8. Changes in the atmosphere can result in changes to the surface of the Earth.	•Investigate climatic changes as evidence for past glaciation	
ST					ST					ST	SC 5 3.1	
FR					FR					FR	VI B5 (9-12)	

C. Hydrosphere: Water – Water Cycle												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
1. There is a water cycle.				<ul style="list-style-type: none">Investigate that water can freeze into a solid and then melt into a liquid againInvestigate that water can evaporate into a gas and then condense into a liquid againIllustrate the water cycle						4. Ocean currents are caused by a variety of factors.	<ul style="list-style-type: none">Compare the temperature and salinity between water masses to discover how density differences can generate currents	
ST				SC 5 3.1	ST					ST	SC 5 1.6	
FR				VI B6 (K-4)	FR					FR	VI B3 (9-12)	
2. Water is an essential natural resource.				<ul style="list-style-type: none">Recognize the importance of water to living organisms						5. Large bodies of water have a major affect on climate.	<ul style="list-style-type: none">Organize data to predict weather patterns associated with large bodies of water	
ST				SC 5 4.1	ST					ST	SC 5 1.8	
FR				VI A6 (K-4)	FR					FR	VI B2 (9-12)	
3. The water cycle has a major role in determining the weather and climate.				<ul style="list-style-type: none">Describe the water cycle as it applies to weather and climate								
ST				SC 5 1.6	ST					ST		
FR				VI A1 (K-4)	FR					FR		

A. Earth, Moon, and Sun												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
1. The positions of the Sun and Moon change in observable patterns.				<ul style="list-style-type: none">•Be aware, illustrate, and describe how the Sun's position in the sky changes over time during a day•Observe and describe how the Sun can be seen only in the daytime, but the Moon can be seen sometimes at night and sometimes during the day•Be aware and illustrate how the Moon's position in the sky changes over time (No Moon phases assessed on Grade 3 MAP.)•Describe daytime as the time between when the Sun first appears over the horizon and totally disappears below the horizon	5. Time (day, month, and year) can be measured by observing the natural cycles of the Sun and Moon.			<ul style="list-style-type: none">•Illustrate and explain the daily rotation of the Earth and the conditions that create sunrise, sunset, noon and midnight•Chart the changes in the shape of the Moon that can be seen from Earth on a day to day cycle that lasts about a month (Name the phases of Moon. Do not discuss the cause of Moon phases.)•Build a model that shows how the Earth revolves around the Sun•Observe and chart that, throughout the school year, the Sun at noon is higher in the summer and lower in the winter by observing the length and positions of shadows•Illustrate and explain a year as the time it takes the Earth to revolve around the Sun, (which can be observed on Earth as the time between absolute shortest shadows)		6. Most objects in the solar system are in regular and predictable motion that explains such phenomena as the day, the year, phases of the Moon, seasons, and eclipses.	<ul style="list-style-type: none">•Model and describe how the Earth's gravity pulls any object on or near the Earth toward it without touching it•Illustrate and describe how the Sun's gravitational pull holds the Earth and other planets in their orbits•Construct a model and describe how planets' gravitational pull keeps their Moons in orbit around them•Illustrate the Moon's orbit around the Earth once in about 28 days; chart the changes in what part of the Moon is lit by the Sun and how much of that part can be seen from the Earth – the phases of the Moon•Create a model or illustration explaining how solar eclipses occur•Create a model or illustration explaining how lunar eclipses occur•Explain how the Earth turns daily on a tilted axis and how sunlight falls more intensely on different parts of the Earth during the year•Compare the seasons using weather patterns and the difference in the heating of the Earth's surface•Compare and contrast the size, composition, and surface of the nine planets in our solar system	
ST				SC 6 1.6	ST			SC 6 1.8; 3.1		ST	SC 6 3.1	
FR				V A2 (K-4)	FR			V B5 (K-4)		FR	V B5 (K-4); V B4 (5-8); V B3 (5-8)	

A. Earth, Moon, and Sun												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
2. The shape of the Moon that can be seen from Earth changes in an observable pattern.				•Observe and chart how the Moon looks a little different every day, but looks the same again about every four weeks								
ST				SC 6 1.6	ST					ST		
FR				V B5 (K-4)	FR					FR		
3. The change in the Sun's position relative to the Earth causes shadows to change.				•Record the changes in the Sun's position in the sky during the course of a day •Chart the shadow changes that are caused by changes in the Sun's position in the sky • List and order the three things necessary to produce a shadow (light source, object, and surface) • Measure in centimeters the change in the length of the Sun's shadow as the Sun's position in the sky changes • Record the change of direction or position of a shadow from morning to midday to afternoon								
ST				SC 6 1.6, 1.4, 3.5	ST					ST		
FR				V B1 (K-4)	FR					FR		
4. Seasons can be observed as a change in weather over the course of a year.	•Identify the seasons •Describe how the seasons impact everyday life											
ST	1.6				ST					ST		
FR	V A5 (K-4)				FR					FR		

B. Solar System												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
					1. The Earth is the third planet from the Sun in a system that includes the Moon, the Sun, eight other planets and their Moons, and smaller objects such as asteroids and comets.			•Compare the size and position of the Sun to the rest of the solar system •Create scale models of the solar system that are accurate in both size and distance •Theorize why people cannot determine how the solar system is put together just by looking at it				
ST					ST			SC 6 1.2		ST		
FR					FR			V B5 (5-8)		FR		
					2. Stars are like the Sun, some being smaller and larger, but so far away that they look like points of light.			•Identify the Sun as the nearest star to Earth and as a producer of light •Create an illustration to show patterns of stars in the sky called constellations •Chart and describe how constellations appear to move across the sky nightly and how different stars can be seen in different seasons				
ST					ST			SC 6 1.6		ST		
FR					FR			V A3 (K-4)		FR		

C. Stars												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
										3. The Sun is a medium-sized star located near the edge of a disc-shaped galaxy of stars.	•Illustrate and explain how monthly changes in the patterns of stars (constellations) occur in the sky as the Earth revolves around the Sun •Research and compare how much closer the Sun is to the Earth than any other star •Compare how long sunlight takes to reach the Earth in comparison to other stars •Discuss why light from the next nearest star takes a few years to arrive	
ST					ST					ST	SC 6 1.1; 1.6; 3.5	
FR					FR					FR	V B5 (K-4)	

D. Gravitational Forces												
Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations				Benchmark	Grade-Level Expectations	
	Grade K	Grade 1	Grade 2	Grade 3		Grade 4	Grade 5	Grade 6	Grade 7		Grade 8, 9, 10	Grade 11-12
										1. Every object exerts gravitational force on every other object.	•Compare the amount of force and the mass of an object to the distance between them •Explain that the force is hard to detect unless at least one of the objects has a lot of mass •Develop a logical description of how Gravitational Laws explain the movement of planets and tides	
ST					ST					ST	SC 6 3.1	
FR					FR					FR	V B2 (9-12)	

Science Grade-Level Expectations: Scope and Sequence

Draft 3/21/03

Topic/Standard	Grade K	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10
Physical Science <u>Matter & Energy</u> Standard 1	Objects and Materials Sounds	Balancing and Measuring	Matter	Forms of Energy: Sound	Forms of Energy: Electricity		Matter, Mixtures, and Solutions	Forms of Energy: Light		Properties of Matter Structure of Matter Changes in Matter	
Physical Science <u>Force & Motion</u> Standard 2	Relative Position Magnets	Describing Motion	Forces		Force and Motion	Sinking and Floating		Machines and Motion		Types of Forces Force and Motion Work and Energy Conservation	
Life Science <u>Living Systems</u> Standard 3	Five Senses Plant and Animal Behaviors	Plant and Animal Characteristics	Life Cycles of Plants and Animals			Plants and Animals	Diversity of Life	Interacting Systems in Humans Diseases			DNA Energy Transfer Within Cells Genetics Natural Selection
Life Science <u>Ecology</u> Standard 4				Interactions and Interdependence of Organisms	Ecosystems		Ecology: Populations		Environmental Changes and Extinction Global Consequences of Ecological Changes		Ecological Cycles Relationships Within Ecosystems Ecological Biodiversity Behaviors Within Ecosystems
Earth Science <u>Earth Systems</u> Standard 5		Observing Weather	Properties of Soil	Properties of Water and the Water Cycle	Land and Water Interactions	Weather Forecasting Rocks and Minerals		Catastrophic Changes in the Earth's Surface	Properties and Processes of Solid Earth Study of the Atmosphere and Hydrosphere Earth Surface Processes		
Earth Science <u>Universe</u> Standard 6	Observing the Changes in Seasons			Observing Patterns of the Sun, Moon, and Shadows			Earth and Space		Earth, Moon, and Sun Solar System Stars		